Bangladesh Journal of Medicine (BJM)
ISSN : 1023 - 1986
eISSN : 2408 - 8366

ORIGINAL ARTICLE

A RETROSPECTIVE OBSERVATIONAL STUDY OF EEG FINDINGS IN A TERTIARY CARE HOSPITAL, DHAKA, BANGLADESH

AMINUR RAHMAN[1], ABDERRAHMANE CHAHIDI[2], MOHAMMAD MOSHIUR RAHMAN[1], MOHAMMAD REZAUL KARIM[3], MOHAMMAD SELIM SHAHI,[4] SHAHJADA MOHAMMAD DASTEGIR KHAN[1], PALLAB KANTI SAHA[1], BIPLAB PAUL[1], A.K.M SHOAB[5], ZAHED ALI[6], UTTAM KUMAR SAHA[7], FIROZ AHMED QURAISHI[8]

Abstract:

Background: *Electroencephalography (EEG) is an electrophysiological observing strategy to record the electrical activity of the brain which is used in a seizure disorder, organicity, and psychiatric conditions. In spite of the overwhelming burden of epilepsy in Bangladesh, there remains a relative scarcity of neurophysiology services and restricted distributed information on electroencephalography (EEG) highlights among the population. The aims of the study to explore the EEG findings of distinctive cases and their associations in various clinical scenarios.* ***Methods:*** *This study was a hospital-based retrospective study on the patients who underwent EEG in the EEG room in the department of Neurology & Medicine in Sir Salimullah Medical College & Mitford Hospital, Dhaka during January 2018 to December 2018. Data were recorded from EEG registers and reports. Data were analyzed utilizing SPSS version 25. Frequency distribution was studied and the Chi-Square test and Logistic Regression were applied for categorical variables.* ***Results:*** *Of the total 245 patients studied, he median age was 10.90 +/- 22.1 years and 53.9% were male. The patient attended for performing EEG the initial clinical diagnosis is not mentioned (64.5%). The commonest reason for EEG referral was to rule out seizure disorder (78.0%), requested mostly from the out-patient department (OPD). EEG abnormality was seen in 35.9% of patients and the site of EEG abnormality in the brain was hemispheric epilepsy (19.2%). The most common type of EEG abnormalities was slow-wave (9.8%). EEG diagnosis was normal (64.5%) most of the patients, whereas the rest of them (35.5%) diagnosed as epilepsy. The EEG abnormality detection rate was significant in those referred from the Department of the out-patient department (OPD) and Neurology.*
Conclusion: *Epilepsy is more common in younger male and the most of the EEG were normal. The commonest type of abnormalities in EEG pattern was slow wave which was hemispheric.*

Keywords: *Electroencephalogram, EEG Findings, Seizure, Bangladesh.*

Received: 22-10-2021 *Accepted: 06-04-2022*
DOI: https://doi.org/10.3329/bjm.v33i2.59286
Citation: *Rahman A, Chahidi A, Rahman MM, Karim MR, Shahi MS, Khan SMD et al. A Retrospective Observational Study of EEG Findings in a Tertiary Care Hospital, Dhaka, Bangladesh. Bangladesh J Medicine 2022; 33: 138-144.*

1. Assistant Professor, Department of Neurology, Sir Salimullah Medical College, Dhaka-1100, Bangladesh.
2. Neurophysiology- Neurosciences, ED 268, DR 178, Centre IFN, Sorbonne University, Paris, France & Moroccan Society of Neurophysiology, Marrakech, Morocco.
3. Assistant Professor &Principal Investigator (PI), Institute of Neuroscience, Hospital, Hubei University of Medicine, Shiyan, Hubei 442000, China.
4. Associate Professor, Department of Neurology, National Institute of Neurosciences & Hospital, Dhaka-1207, Bangladesh
5. Assistant Professor, Sylhet M.A.G.Osmani Medical Collefe, Neurology, Sylhet, Bangladesh
6. Professor, Department of Neurology, Sir Salimullah Medical College, Dhaka- 1100, Bangladesh.
7. Professor (Retd.), Department of Neurology, National Institute of Neurosciences & Hospital, Dhaka-1207, Bangladesh.
8. Professor, Department of Neurology, Anwer Khan Modern Medical College, Dhaka-1205, Bangladesh.

Address of Correspondence: Dr. Aminur Rahman, Assistant Professor, Department of Neurology, Sir Salimullah Medical College, Dhaka- 1100, Bangladesh. E-mail: draminur@yahoo.com cell no: +8801711180902. Orcid.org/0000-0001-9261-7734

Introduction:

Electroencephalography (EEG) refers a non-invasive electrophysiological method to record the electrical activity of the brain by multiple electrodes placed on the scalp, although invasive electrodes are sometimes used, as in electrocorticography. [1] The main use of this noninvasive test is in epilepsy to detect seizure activity, a common problem with an estimated worldwide prevalence of 5–30 persons per 1000.[2]

EEG is the most often used to diagnose epilepsy, which causes abnormalities in EEG, readings. [3] It is also help to diagnose sleep disorders, depth of anesthesia, coma, encephalopathies, and cerebral death .[4] EEG used to be a first-line method of diagnosis for stroke, tumors, and other focal neurological disorders, but this use has decreased with the arrival of high-resolution anatomical neuroimaging techniques like computed tomography (CT) and magnetic resonance imaging (MRI). [5] The use of this neurophysiological tool has been minimum in psychiatry despite the known relationship between epilepsy and psychosis and other psychiatric manifestations, especially with the abnormalities in the temporal lobe. [6]

Patients are referred for EEG for various reasons, usually for seizure, pseudo seizure, organicity, and psychosis. There is a paucity of reported literature on EEG findings although many institutes conduct EEG in Bangladesh. The present study was conducted in the Department of Neurology, Sir Salimullah Medical College Mitford Hospital, a tertiary care health center at Dhaka, Bangladesh which started its EEG services from 2013. It aims to bridge the present knowledge gap and explore the EEG findings among different cases requested for EEG and their associations.

Methods:

This study was an analytical retrospective hospital based cross-sectional descriptive study and conducted in the department of Neurology, Medicine and Pediatrics in Sir Salimullah Medical College & Mitford Hospital, Dhaka during January 2019 to December 2019. All the patients referred for EEG were considered for the study. Data of 245 patients were taken from EEG register and EEG reports.

The patients requested for EEG underwent a routine non-sleep deprived EEG using the international standardized 10–20 system of electrode placement. Photic stimulation and hyperventilation methods were used during the EEG recordings where age was not a barrier. All EEGs were done by one technician with the same EEG machine (16 channels RMS digital). All records were reported by the clinical neurophysiologists. A structured proforma was used to record the information on the variables like age, sex, probable clinical diagnosis and reasons for referral. EEG findings and EEG diagnosis were tabulated from EEG reports. EEG results were categorized as normal and abnormal. EEG findings were categorized as Localization Related Epilepsy (LRE) and Generalized Epilepsy (GE) for focal epileptiform activity and generalized epileptic activity respectively.

Their informed written consent was taken in a consent form before collecting data. Proper permission was taken from the concerned departments and local ethical committee.

Exploratory data analysis were carried out to describe the study population where categorical variables were summarized using frequency tables while continuous variables were summarized using measures of central tendency and dispersion such as mean, median, percentiles , standard deviation and Chi-square test. Frequency distribution was studied and Chi Square test was applied for categorical variables to test for associations. The only continuous variable studied was the age which was categorized in the interval of 10. A suitable measure of central tendency was computed after Shapiro-Wilk normality test. A binary logistic regression was performed to ascertain the effect of age on the likelihood that patients have abnormal EEG. All statistical analysis were performed using SPSS 23.0 for Windows (SPSS Inc., Chicago, Illinois, USA) level of significance was set at .05 and p-value <0.05 was considered significant.

Results:

Table: I Shows the demographic characteristics are given in .The majority of the patients belonged to the age group 1-10 years, comprising 37.6% (92) of the total study population. The median age was 10.90 years with an interquartile range of 22.1. Males were slightly more (53.9%) than females. Most of the patients (64.1%) did not have any clinical diagnosis mentioned at the time of requesting for EEG. Those diagnosed with seizure disorder (17.5%) were the second highest among those referred for EEG evaluation. The reason for referral for EEG was the exclusion of seizure disorder in the majority of cases (78.0%). Majority (72.2%) of the EEGs were requested by the Out-patient Department (OPD) and 9.8% of the EEG requested from the Department of Neurology.

Table-I

Demographic characteristics in patients with EEG examinations

Variables	Categories	Number	%
Age	<1	23	9.4
	1-10	92	37.6
	11-20	73	29.8
	21-30	32	13.1
	31-40	14	5.7
	41-50	7	2.9
	51-60	3	1.2
	61-70	1	0.4
	>70	0	0
Gender	Male	132	53.9
	Female	113	46.1
Clinical Diagnosis	Not Mentioned	157	64.1
	Seizure Disorder	43	17.5
	Seizure with Comorbid Psychiatric Illness	9	3.7
	Organic Pathology	11	4.5
	Dissociative Disorder	25	10.2
Referral Reason	To Rule Out Seizure	191	78.0
	Organicity Work Up	17	6.9
	To Evaluate Treatment Response	37	15.1
Referring Department	Psychiatry	2	0.8
	Pediatrics	19	7.8
	Not Available	1	0.4
	Neurology	24	9.8
	Medicine	21	8.6
	Surgical	1	0.4
	OPD	177	72.2

Table: II illustrates the findings of EEG where the abnormality was seen in 35.9% (88). Among them, 15.9% (39) had generalized epilepsy and 20.0% (49) had localization related epilepsy. The most common abnormal pattern in EEG was slow wave (9.8%) and the location was hemispheric (19.2%) followed by generalized (10.6%).

Table: III Demonstrate analysis on the abnormal EEG distribution based on demographic characteristics demonstrates, most of them belonged to the age group of 1-10 years with the median age of 7.71 years. The logistic regression model, used to predict the effect of age on the likelihood that the patients develop abnormal EEG, was statistically significant ÷2 (1) = 31.348, p = 0.000. The model explained 35.9% (Nagelkerke R2) of the variance in EEG abnormality and correctly classified 64.1% of cases. Increasing age was associated with a decreased likelihood of having EEG abnormality with 0.062 (95% CI 0.005 – 0.723) p = 0.027. The patients who had abnormal EEG were younger overall (mean age 9.89 years vs 14.34 years).

The gender distribution was almost equal with male (56.82%) and female (43.18%). The Chi Square test did not show any statistically significant association between the occurrence of positive EEG result between the two genders (÷(1) =0.478, p = 0.507). The abnormality detection rate was more in seizure disorder (19.32%) and those with Dissociative Disorder (6.82%). Similarly, the cases referred for the exclusion of seizure had EEG abnormality in 80.68% which is statistically insignificant (÷(1)=0.592, p = 0.521) and so are the other reasons of referral for EEG. The referral from OPD (79.55%) (÷(1) = 3.650, p= 0.074);Pediatricians (10.23%) (÷(1)=1.173,p= 0.322) were not significant whereas the referring from Neurology (4.55%) (÷(1)=4.284, p = 0.044) had abnormal EEG with statistically significant associations. (Tables III and IV).

Table-II

EEG Characteristic features of patients

EEG Characteristics	Categories	Number	%
Abnormality	Present	88	35.9
	Absent	157	64.1
EEG Diagnosis	Normal	157	64.1
	Generalized epilepsy	39	15.9
	Localization related epilepsy	49	20.0
Types of Abnormality	Slow wave	24	9.8
	Spike and wave	15	6.1
	Spike wave	9	3.7
	Slow wave and spike and wave	5	2.0
	Slow wave and spike wave	22	9.0
	Sharp wave	5	2.0
	Sharp wave and spike wave	4	1.6
	Slow wave and sharp wave	4	1.6
Sites of Abnormality	Generalized	26	10.6
	Hemisphere	47	19.2
	Frontal	1	0.4
	Frontotemporal	4	1.6
	Frontoparietal	7	2.9
	Occipitofrontal	1	0.4
	Temporoparietal	2	0.8

Table-III

Abnormal EEG distribution based on demographic characteristics

Variables	Categories	Abnormal Number	%	Total Number
Age	<1	9	10.23	23
	1-10	42	47.73	92
	11-20	32	36.36	73
	21-30	4	4.55	32
	31-40	1	1.14	14
	41-50	0	0	7
	51-60	0	0	3
	61-70	0	0	1
	>70	0	0	0
Gender	Male	50	56.82	132
	Female	38	43.18	113
Clinical Diagnosis	Not mentioned	62	70.45	157
	Seizure Disorder	17	19.32	43
	Seizure with Comorbid Psychiatric Illness	2	2.27	9
	Organic Pathology	1	1.14	11
	Dissociative Disorder	6	6.82	25
Referral Reason	To rule out Seizure	71	80.68	191
	Organicity work up	5	5.68	17
	To evaluate treatment response	12	13.64	37
Referring Department	Psychiatry	0	0	2
	Pediatrics	9	10.23	19
	Not Available	1	1.14	1
	Neurology	4	4.55	24
	Medicine	4	4.55	21
	Surgical	0	0	1
	OPD	70	79.55	177

Table IV

Abnormal EEG distribution statistical analysis summary

Predictors of abnormal EEG		Test	P value
Age		Logistic Regression	0.000
Gender		Chi-Square	0.507
Referral Reason	To rule out seizure	Chi-Square	0.521
	Organicity work up	Chi-Square	0.794
	To evaluate treatment response	Chi-Square	0.712
Referring Department	Psychiatry	Chi-Square	0.538
	Pediatrics	Chi-Square	0.322
	Not Available	Chi-Square	0.359
	Neurology	Chi-Square	0.044
	Medicine	Chi-Square	0.102
	Surgical	Chi-Square	1.000
	OPD	Chi-Square	0.074

Discussion:

Since seizure is more common in a younger age in developing countries and EEG is requested mostly for the exclusion of seizure, this might explain the reason for EEG referral for age group distribution in our study.[7] Mac et al showed a bimodal age distribution of epilepsy patients in developed countries with the first peak in childhood and another one in old age. Except for Shanghai in China, most of the Asian countries have younger epileptic patients. 8 The probable reason for the missing peak in the older age group in many Asian countries is due to the fact that most of the population are younger compared to the number of old people. [8, 9] The trend in the point prevalence of active epilepsy by 10-year age groups is consistent with previous reports.[10]

Sex, while not commonly thought to affect the occurrence of epilepsy, may contribute to differences in epilepsy incidence.[10] The incidence of epilepsy tended to be higher in males than females. Here a male predominant (53.9%) picture is seen. Similar to reports from other Asian countries, there was slightly male predominance.[11] Epilepsy is slightly more common in men than in women but the sex-specific prevalence is not, in general, significantly different. 8 Reports are similar in other Asian countries. [12] Many studies report a higher incidence in males than female in both developed and developing countries.[13]

EEG referral from psychiatrists reported abnormality in 40 % of the study population in Bangladesh, 46.47% in our study, 17.6% in the study by O'Sullivan, 11.3% in the study by Lam but only 8.2% in the African study. [14-17] This disparity could be due to variation in sample size, sample type as well as interpreter variability. Different studies showed few or no positive finding in EEG in psychiatric conditions, including ours.[15, 16]

The reason for referral in this study showed that to rule out seizure (78%) was the commonest reason for referral; evaluate treatment response 15.1% and a few other minor conditions. The finding from this study that seizure was the commonest reason for which patients were referred for EEG is analogous to some other studies in Nigeria[17, 18], Africa[19] and Europe[20] but differs from the results of a study from USA[21]. Harmon et al, reported that the commonest reason for EEG referral was altered mental status 52 (26%) followed by seizure 48 (24%) [22]. Some other authors are of the opinion that the reason for requesting for EEG could vary between clinicians. [23] Smith et al, in their study reported that epilepsy and seizure accounted for (62%) of the referral from neurologists while other doctors used EEG procedure as a diagnostic tool as it was not uncommon for them to refer patients with clinical history of "funny turning" or "aggressive outburst," to exclude seizure. [23]

Several published studies on epilepsies showed that the chance of detecting interictal epileptiform discharges (IEDs) from the first EEG varies between 29% and 55% at outdoor monitoring of patients. [24, 25] The present study data also reveals the same scenario. However, in some studies, it is evident that EEG may be positive up to 70% case.[26] However,

Bhagat et al reported normal EEG in the majority which was done among the epileptics.[27] This difference is expected as EEG is a cross-sectional record of the brain activity and 50% of patients with epilepsy can have normal EEG, and therefore, does not exclude epilepsy.[28]

In a previous study in Bangladesh, it has been found EEG the abnormalities in 48.7% cases of which 23.7% cases showed focal epileptic discharge; 10.5% cases showed generalized epileptic discharge; 13.2% cases showed focal or generalized slowing and 51.0% cases were normal.[13] In another study in Bangladesh, EEG was done in 1386 patients among them, 36% had abnormal EEG findings. [29]

The major abnormality pattern in EEG in our study and Molokomme was slow waves (9.8%). [15] However, spike and wave were reported in Chowdhary et al as common EEG pattern.[14] In a series of 2648 patients with the unquestionable diagnosis of the seizure by Kershman et al, 46.5% had focal changes while 15.0% had a diffuse generalized abnormality in their scalp recordings of EEG.[30] In our study, EEG was done in 245 patients in which EEG was normal in 64.1% patients and abnormal in 35.9% patients, of which 19.2% had hemisphere and 10.6% had a generalized epileptic discharge.

Conclusion:

EEG may be a relatively inexpensive and non-invasive test for the detection of electrical activity within the brain. In our study epilepsy is more common in male younger aged patients. The commonest reason for EEG referral was to rule out seizure disorder and the most of EEG are normal. The most common type of abnormalities in EEG pattern is slow wave which is hemispheric. For the prediction of abnormality in EEG, more variables and their association with seizure/ organicity need to be looked into.

Limitations:

There are some limitations. Firstly the clinical details of the patients referred for EEG were not available. There is chance of sampling bias. Moreover, the chance of inter observer biasness was minimized by following same principle in recording and typing the EEG abnormality.

Funding:

No funding sources.

Conflict of interest:

None of the authors has any conflict of interest to disclose.

Ethical consideration:

The study was conducted after approval from the ethical review committee. The confidentiality and anonymity of the study participants were maintained.

Acknowledgment:

The authors were grateful to the staff and management of the Department (OPD) of Neurology in Sir Salimullah Medical College Mitford Hospital, Bangladesh.

References:

1. Niedermeyer E.; da Silva F.L. Electroencephalography: Basic Principles, Clinical Applications, and Related Fields. Lippincott Williams & Wilkins; 2004.
2. Lowenstein DH. Seizures and Epilepsy. In: Kasper D, Fauci A, Hauser S, Longo D, Jameson JL, Loscalzo J, editors. Harrisons Princ Intern Med [Internet]. 20th ed. New York, NY: McGraw-Hill Education; 2018.
3. Tatum, William O. Handbook of EEG interpretation. Demos Medical Publishing. 2014; 155-190. https://doi.org/10.1891/9781617051807
4. Chernecky, Cynthia C.; Berger, Barbara J. (2013). Laboratory tests and diagnostic procedures (6th ed.). St. Louis, Mo.: Elsevier.
5. Panayiotopoulos CP. The Epilepsies: Seizures, Syndrom es and Management. Oxfordshire (UK): Bladon Medical Publishing; 2005.
6. Towle VL, Bolaños J, Suarez D, Tan K, Grzeszczuk R, Levin DN, Cakmur R, Frank SA, Spire JP. The spatial location of EEG electrodes: locating the best fitting sphere relative to cortical anatomy. Electroencephalogr Clin Neurophysiol. 1993 Jan; 86(1):1-6.https://doi.org/10.1016/0013-4694(93)90061-Y
7. Comprehensive Textbook chapter1.pdf [Internet]. [Cited 2017 Aug 6]. Available from: http://staging.ilae.org/booksales/data/pages/Comprehensive%20Textbook%20chapter1.pdf.
8. Mac TL, Tran DS, Quet F, Odermatt P, Preux PM, Tan CT. Epidemiology, etiology, and clinical management of epilepsy in Asia: ASystematic Review. Lancet Neurol 2007;6:533-543. https://doi.org/10.1016/S1474-4422(07)70127-8
9. Singhal BS: Neurology in developing countries: population perspective. Arch Neurol 1998;55:1019-1021 https://doi.org/10.1001/archneur.55.7.1019 PMid:9678322
10. Banerjee PN, Filippi D, Allen Hauser W. The descriptive epidemiology of epilepsy-a review. Epilepsy Res 2009; 85:31-45. https://doi.org/10.1016/j.eplepsyres.2009.03.003 PMid:19369037 PMCid:PMC2696575

11. Fong G, Mak W, Cheng T, Chan K, Fong J, Ho S. A prevalencestudy of epilepsy in Hong Kong. Hong Kong Med J 2003;9:252-7

12. Noronha AL, Borges MA, Marques LH, Zanetta DM, Fernandes PT, De Boer H, et al. Prevalence and pattern of epilepsy treatment in different socioeconomic classes in Brazil. Epilepsia. 2007; 48(5):880-5 https://doi.org/10.1111/j.1528-1167. 2006.00974.x PMid:17326788

13. Salam A, Quddus MR, Sheikh MS, Azim MA, Hussain ME. Clinico-Demographic Characteristics and Different Diagnostic Findings of Epilepsy Patients in a Specialized Hospital outside Dhaka in Bangladesh. Journal of National Institute of Neurosciences Bangladesh. 2016;2(1):3-9. https:/ /doi.org/10.3329/jninb.v2i1.32954

14. Chowdhury RN, Daisy S, Rahman KM, Khan SU, Hasan A, Khan ZR, Haque B, Hoque MA, Mondol BA, Habib M, others. Study of EEG Findings in Patients Referred from Psychiatrists. J Bangladesh Coll Physicians Surg. 2012; 30(1):24. https:// doi.org/10.3329/jbcps.v30i1.11363

15. 15. Molokomme M, Subramaney U. Assessing the usefulness of electroencephalography in psychiatry: Outcome of referrals at a psychiatric hospital. South Afr J Psychiatry. 2016 Aug 19; 22(1):3.https:// doi.org/10.4102/sajpsychiatry.v22i1.702

16. Lam RW, Hurwitz TA, Wada JA. The clinical use of EEG in a general psychiatric setting. Hosp Community Psychiatry. 1988 May;39(5):533-536.https://doi.org/10.1176/ps.39.5.533 PMid: 3378750

17. Olisah VO, Adekeye O, Okpataku CI, Eseigbe EE. Electroencephalographic findings in patients referred for electroencephalogram in a University Teaching Hospital in Northern Nigeria. Sahel Med J. 2015;18:78-82. doi: 10.4103/1118-8561. 160805.https://doi.org/10.4103/1118-8561. 160805

18. Aina OF, Malomo IO, Ladapo HTO, Amoo IG. One year of EEG unit at Psychiatric Hospital Yaba, Lagos. The Nigerian Postgraduate Medical Journal. 2004;11(3):212–214.

19. Kwasa TO, Muthingi PM. The experience with electroencephalography at the Kenyatta Nationa Hospital, Nairobi. East African Medical Journal. 1992;69(5):259–261. [PubMed] [Google Scholar]

20. O'Toole O, Lefter S, Mcnamara B. EEG use in a tertiary referral centre. Irish Medical Journal. 2011; 104(7):202–204.

21. Harmon LA, Craddock M, Jones E. Effect of inpatient electroencephalography on clinical decision making. J Am Osteopath Assoc. 2013;113(12):891-896..https://doi.org/10.7556/ jaoa.2013.067 PMid:24285031

22. Audit of electroencephalography requests: Use and misuse. Seizure. 2006;15:184-189. https://doi.org/ 10.1016/j.seizure.2006.01.003 PMid:16488630

23. Smith D, Bartolo R, Pickles RM, Tedman BM. Requests for electroencephalography in a district general hospital: retrospective and prospective audit. BMJ. 2001; 322:954-957.https://doi.org/ 10.1136/bmj.322.7292.954 PMid:11312226 PMCid:PMC31034

24. Goodin DS, Aminoff MJ, Laxer KD. Detection of epileptiform activity by different noninvasive EEG methods in complex partial epilepsy. Annals of neurology. 1990;27(3):330-4 https://doi.org/ 10.1002/ana.410270317 PMid:2327741

25. Salinsky M, Kanter R, Dasheiff RM. Effectiveness of multiple EEGs in supporting the diagnosis of epilepsy: an operational curve. Epilepsia. 1987;28(4):331-4 https://doi.org/10.1111/j.1528-1157.1987.tb03652.x PMid:3622408

26. Schreiner A, Pohlmann-Eden B. Value of the early electroencephalogram after a first unprovoked seizure. Clinical EEG 2003;34(3):140-4 https:// doi.org/10.1177/155005940303400307 PMid: 14521275

27. Bhagat R. Clinical Pattern of Epilepsy and their Electroencephalogram Findings. J Neurol Neurophysiol. 2015 Dec 16; 1-3.https://doi.org/ 10.4172/2155-9562.1000335

28. Flink R, Pedersen B, Guekht AB, Malmgren K, Michelucci R, Neville B, Pinto F, Stephani U, Ozkara C, Commission of European Affairs of the International League Against Epilepsy: Subcommission on European Guidelines. Guidelines for the use of EEG methodology in the diagnosis of epilepsy. International League Against Epilepsy: commission report. Commission on European Affairs: Subcommission on European Guidelines. Acta Neurol Scand. 2002 Jul;106(1):1-7.https://doi.org/ 10.1034/j.1600-0404.2002.01361.x PMid:12067321

29. Khan SU. Characteristics of epilepsy patients at a tertiary care hospital in Bangladesh. Research 2014;1:74 https://doi.org/10.13070/rs.en.1.741

30. Kershman J, Vasques J, Golstein S. The incidence of focal and non-focal EEG abnormalities in clinical epilepsy. Electro encephal Clin Physiol 1951;3:15-24 https://doi.org/10.1016/0013-4694(51)90050-8.